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जहाजों में विद्युत संस्थापन

भाग 3 उपस्कर

अनुभाग 19 दूर संचार और जलपोतों में प्रयुक्त पावर केबलों पर खोल चढाने की सामग्री — विशिष्टि

Indian Standard

ELECTRICAL INSTALLATION IN SHIPS

PART 3 EQUIPMENT

Section 19 Sheathing Materials for Telecommunication and Power Shipboard Cables — Specification

UDC 629·12·06 : 621·316·174 : 621·315·221·8 : 621·315·616·9

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

December 1990 **Price Group 2**

Electrical Equipment and Installations in Ships Sectional Committee, ETD 26

FOREWORD

This Indian Standard (Part 3/Sec 19) was adopted by the Bureau of Indian Standards on 24 April 1990, after the draft finalized by the Electrical Equipment and Installations in Ships Sectional Committee had been approved by the Electrotechnical Division Council.

This standard (Part 3/Sec 19) is one among the series of Indian Standards on electrical installations in ships. This series consists of the following parts:

Part 1	General,
Part 2	System design,
Part 3	Equipment,
Part 4	Installation and test of completed installation, and
Part 5	Special features.

In Part 3, for ease in reference, Sections 10 to 19 have been reserved for the low and medium voltage power cables while Sections 20 to 29 would deal with telecommunication cables for use in ships.

This standard (Part 3/Sec 19) deals with the requirements for sheathing materials for telecommunication and power shipboard cables. Other sections dealing with the low voltage power cable are as follows:

Part 3/Sec 10	Low voltage cables for power systems: Section 10 General construction and test requirements,
Part 3/Sec 11	Insulating materials for shipboard power cables, and
Part 3/Sec 12	Choice and installation of cables for low voltage systems.

In this standard, for details of test methods reference has been made to appropriate parts of IS 10810 : 1984 'Methods of test for cables', which is, therefore, necessary adjunct to this standard.

In the preparation of this standard, assistance has been taken from IEC Pub 92-359 (1987) 'Electrical installations in ships: Part 359 Sheathing materials for shipboard power and telecommunication cables', issued by the International Electrotechnical Commission.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ELECTRICAL INSTALLATION IN SHIPS

PART 3 EQUIPMENT

Section 19 Sheathing Materials for Telecommunication and Power Shipboard Cables — Specification

1 SCOPE

1.1 This standard (Part 3/Sec 19) specifies the test requirements for mechanical and particular characteristics of sheathing materials intended to be used in telecommunication and power shipboard cables.

2 REFERENCES

2.1 Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 SHEATHING MATERIALS

3.1 General

The types of sheathing compounds covered by this standard are listed in Table 1 together with abbreviated designation and operating temperature limits of the conductor of the cables for which they can be used.

3.2 Mechanical Characteristics

The test requirements for mechanical characteristics of both aged and non-aged sheathing compounds are listed in Table 2.

3.3 Particular Characteristics

The test requirements for particular characteristics of sheathing compounds are listed in Table 3.

Table 1 Types of Sheathing Compounds

(*Clause* 3.1)

Type of Sheathing Compound	Abbreviated Designation	Temperature Limit of the Cable Conductor in Normal Operation
(1)	(2)	(3)
a) *Thermoplastic*		
Based upon polyvinylchloride or copolymer of vinylchloride and vinylacetate	ST 1 ST 2	60 85
b) *Elastomeric or thermosetting*		
Based upon polychloroprene rubber	SE 1	85
Based upon chlorosulphonated polyethylene or chlorinated polyethylene rubber	SH	85

NOTE — Equivalent materials may be accepted on agreement between the manufacturer and final user.

Table 2 Test Requirements for Mechanical Characteristics of Sheathing Compounds

(*Clause* 3.2)

Designation of the Sheathing Compound (1)		**ST 1** (2)	**ST 2** (3)	**SE 1** (4)	**SH** (5)	**Method of Test (Ref to Part No. of IS 10810)** (6)
1 Mechanical characteristics without ageing						7
1.1 Tensile strength, *Min*	(N/m²)	12·5	12·5	10·0	10·0	
1.2 Elongation at break, *Min*	(percent)	150	150	300	250	
2 Mechanical characteristics after ageing in air oven						11
Treatment: Temperature (tolerance ± 2°C)	(°C)	100	100	100	100	
Treatment: Duration	(h)	168	168	168	168	
2.1 Tensile strength:						
a) Minimum value	(N/m²)	12·5	12·5	—	—	
b) Variation, *Max*	(percent)	± 25	± 25	± 30	—	
c) Percentage of the value found on the unaged specimen, *Min*	(percent)	—	—	—	70	
2.2 Elongation at break:						
a) Minimum value	(percent)	150	150	250	—	
b) Variation, *Max*	(percent)	± 25	± 25	± 40	—	
c) Percentage of the value found on the unaged specimen, *Min*	(percent)	—	—	—	60	
3 Mechanical characteristics after immersion in hot oil						16
Treatment: Temperature (tolerance ± 2°C)	(°C)	—	—	100	100	
Treatment: Duration	(h)	—	—	24	24	
3.1 Tensile strength:						
a) Variation, *Max*	(percent)	—	—	± 40	—	
b) Percentage of the value found on the specimen not immersed, *Min*	(percent)	—	—	—	60	
3.2 Elongation at break:						
a) Variation, *Max*	(percent)	—	—	± 40	—	
b) Percentage of the value found on the specimen not immersed, *Min*	(percent)	—	—	—	60	
4 Hot set test						30
Treatment: Temperature (tolerance ± 2°C)	(°C)	—	—	200	—	
Treatment: Time under load	(Minutes)	—	—	15	—	
Treatment: Mechanical stress	(N/m²)	—	—	20	—	
4.1 Maximum elongation under load	(percent)	—	—	175	—	
4.2 Maximum permanent elongation after cooling	(percent)	—	—	15	—	
5 Water absorption (Gravimetric)		(under consideration)				33
a) Average stress						
b) Increase in capacitance, *Max*	(V/mm)					
i) 1 to 14 days						
ii) 7 to 14 days						

Table 3 Test Requirements for Particular Characteristics of Sheathing Compounds

(*Clause* 3.3)

Designation of the Sheathing Compound		ST 1	ST 2	SE 1	SH	Method of Test (Ref to Part No. of IS 10810)
(1)		(2)	(3)	(4)	(5)	(6)
1 Pressure test at high temperature						15
Treatment: Temperature (tolerance ± 2°C)	(°C)	80	80	—	—	
Treatment: Duration under load:						
—for cables having an outer diameter < 12·5 mm	(h)	4	4	—	—	
—for cables having an outer diameter > 12·5 mm	(h)	6	6	—	—	
1.1 Maximum permissible deformation	(%)	50	50	—	—	
2 Heat shock test						14
Treatment: Temperature (tolerance ± 3°C)	(°C)	150	150	—	—	
Treatment: Duration	(h)	1	1	—	—	
3 Loss of mass						10
Treatment: Temperature (tolerance ± 2°C)	(°C)	—	100	—	—	
Treatment: Duration	(h)	—	168	—	—	
3.1 Maximum loss of mass	(mg/cm^2)	—	1·5	—	—	
4 Behaviour at low temperatures						20 & 21
4·1 Bending test (for cables with outer diameter up to and including 12·5 mm)						
Treatment: Temperature (tolerance ± 2°C)	(°C)	−15	−15	—	—	
Treatment: Duration	(h)	16 (*)	16 (*)	—	—	
4.2 Elongation test (for cables not subject to the bending test)						
Treatment: Temperature (tolerance ± 2°C)	(°C)	−15	−15	—	—	
Treatment: Duration	(h)	4 (†)	4 (†)	—	—	
4.3 Cold impact test						
Treatment: Temperature (tolerance ± 2°C	(°C)	−15	−15	—	—	
Treatment: Duration	(h)	16 (‡)	16 (‡)	—	—	
5 Flame retardant characteristics		(values under consideration)				53

NOTE — Further parts under IS 10810 carrying methods of tests for checking various characteristics for flame retardance properties of the cables are under consideration. Till such time the relevant Indian Standards are available, the flame retardant cables may be checked in accordance with IEC Pub 331 (1970) 'Fire resisting characteristics of electrical cables' and IEC Pub 332 (1970) 'Test on electric cables under fire conditions'.

*If the apparatus has been pre-cooled, a shorter cooling period is permissible, but not loss than 4 h provided that the samples have attained the prescribed test temperature. If the apparatus and test specimens have been pre-cooled, a cooling time of 1 h after each test piece has been fixed to the apparatus is sufficient.

†If the apparatus has been pre-cooled, this period may be reduced to 2 h, and if the apparatus and test piece have been pre-cooled, the conditioning time after the test piece has been fixed in the apparatus shall be not less than 30 min.

‡If the apparatus has been pre-cooled, a shorter cooling period is permissible, but not less than 1 h provided that the test pieces have attained the prescribed test temperature.

ANNEX A

(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
10810 (Part 7) : 1984	Methods of test for cables: Part 7 Tensile strength and elongation at break of thermoplastic and elastomeric insulation and sheath
10810 (Part 10) : 1984	Methods of test for cables: Part 10 Loss of mass test
10810 (Part 11) : 1984	Methods of test for cables: Part 11 Thermal ageing in air
10810 (Part 14) : 1984	Methods of test for cables: Part 14 Heat shock test
10810 (Part 15) : 1984	Methods of test for cables: Part 15 Hot deformation test
10810 (Part 16) : 1986	Methods of test for cables: Part 16 Accelerated ageing test by oxygen pressure method
10810 (Part 20) : 1984	Methods of test for cables: Part 20 Cold bend test
10810 (Part 21) : 1984	Methods of test for cables: Part 21 Cold impact test
10810 (Part 30) : 1984	Methods of test for cables: Part 30 Hot set test
10810 (Part 33) : 1984	Methods of test for cables: Part 33 Water absorption test (Gravimetric)
10810 (Part 53) : 1984	Methods of test for cables: Part 53 Flammability test

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Doc : No. ETD 26 (3068)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Arcee Press, New Delhi, India